2004

The Montreal Project: A Comprehensive Approach to Comprehensive Design

Matthew W. Fisher
Iowa State University

Gregory S. Palermo
Iowa State University, gpalermo@iastate.edu

Thomas W. Leslie
Iowa State University, tleslie@iastate.edu

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MATTHEW FISHER
GREGORY PALERMO, FAIA
THOMAS LESLIE, AIA
Iowa State University

INTRODUCTION — APPROACHING COMPREHENSIVE DESIGN: HOW WE GOT HERE

One of the continuing perplexities in architectural education is 'integration'. How can we assist our students with integrating the lessons and knowledge of history, theory and technology studies into their design work; and the lessons, skills and knowledge of representation, site, program and project complexity from one year to the next in a cumulative manner rather than a sequential manner? How can we help our students push further into design than the formal and superficial image of 'the concept'? In other words: how to achieve comprehensive integrative depth of the full range of architectural studies made manifest through embedment in design work. Reflective education demands more than the proposition: "If we provide good stuff, they will learn it and make it their own."

The Department of Architecture at Iowa State has an Undergraduate Program Committee that meets regularly to discuss student performance and curriculum. For much of the decade from 1991 to 2001, the faculty of the department met at the end of each semester to assess the work of the semester, and to select outstanding projects for exhibition. Currently we meet at the beginning of each semester to discuss similar issues. Periodically student work of high, medium and low pass from the studios has been posted and discussed. Both the College of Design and the Department have strategic planning activities to which the Undergraduate Program Committee contributes.

We have maintained three strata in the undergraduate program in architecture (550 students): a year of pre-architecture: five semesters of intense required coursework; followed by three semesters of elective courses and elective studios, of which one is typically an international semester, and another of which includes student framed design research projects that are typically diverse in scale, scope and content. The pedagogical framing of the final three semesters is designed to provide depth and exploratory enrichment to core competencies mastered in the prior five semesters.

The focus of considerable faculty discussion has been the pivotal first semester of the fourth year where students are expected to draw it all together – for students to demonstrate, if you will, the capacity to make sense of history, technology, design methodology, programming and site, using them creatively in a complex comprehensive design problem of 50-60,000 SF. For many years we used the 'petal approach'. Prior to the Arch 401 studio students had taken three semesters of structures, two of history, two of theory electives, programming and research methods, two of representation media, and four of construction and environmental technologies. Our students are bright and motivated – having experienced and completed each of these 'petals', we expected them to assimilate the material and read the tea-leaves: to 'get it' and apply 'it'.

Throughout the 1990's the faculty reflected upon this conundrum: most students prospered within this method, but a persistent minority did not. How do we fix this? This was the subject of extensive discussion. The following are a few quotes from faculty minutes on the topic:

> "... Additionally, too many [students] appear to lack mastery of basic architectural skills and knowledge: the ability to integrate technology, history and theory material in projects; to understand precedent; ....
>
> [We need to] define what we mean by "integrative" and "integration." Much of the knowledge sustaining architecture comes from other distinct disciplines with their own rigor and culture. Is 'integration' a primary objective of our

teaching? Does 'integration' deny or make those disciplines subservient? What types of teaching are 'integrative'?' (7 Dec 1994: Undergraduate Committee comments regarding departmental strategic planning input.)

Based upon discussions within the Undergraduate Program Committee, several proposals for discussion were put forward at a faculty Strategic Planning retreat on 5 March 1999. At that time, the faculty focused on three fundamental issues that they believed the undergraduate program needed to address:

a) **"Integration**: that students demonstrate more complete integration of the full range of architectural knowledge including structures, materials and assemblies, history and working methods in the studio;

b) **Comprehensiveness**: to do so in a manner in which all students at least meet the minimal test of 'comprehensiveness' and 'integration' as defined in the NAAB criteria 22 and 29; and

c) **Connectivity**: to demonstrate that the curriculum builds upon itself and that students carry forward developed knowledge and skills from year to year." (21 April 1999: Undergraduate Committee Report for departmental strategic planning process)

Subsequent discussions in the Undergraduate Committee led to the development of a curriculum proposal to address the issue of comprehensive design:

"This proposal in draft form is the Undergraduate Program Committee's first effort to frame an approach to the issues raised at the January retreat. It sets forth a curricular change proposal and its supporting rationale to include a 'comprehensive' studio project in the undergraduate course of study. In putting it forward, we have tried to maintain the centrality of cultural issues in our work while enriching student mastery of others. Thus, rather than derailing or substantially changing the studio sequence or objectives, an additional 3 credit team-taught studio/seminar, Arch 405, has been proposed which will operate as a co-requisite for Arch 401 and Arch 402." (6 March 01: Undergraduate Committee proposal to faculty: adopted in principle by the full faculty)

"While our graduates have done well, concerns regarding undergrad performance improvement have been variously expressed as: improving capacity to bring forward information and skills students learn in one year to the next; better independent research skills; better abilities to integrate the work of the full range of curricular studies in design work; the ability to do a comprehensive project; improved design methodology." (9 Dec. 2001 Undergraduate Committee comments regarding curricular revisions as part of a college-wide Envisioning process.)

In each case, subsequently to the reflections and challenges, incremental changes were made in the curriculum. One change was introducing programming into studio curriculum, and more closely aligning design media and programming courses with studio. Another was a change to the undergraduate course sequence, condensing the timing of the technology courses (structures, materials and assemblies, environmental controls) so that they would be completed by the end of the third year. We envisioned that this would enable our students to undertake a project of comprehensive integration in the fall of the fourth year. We found, however, that not all students had completed the technology courses, and that there were limits to how much development could occur in a 6.0 credit studio alone.

Finally, in the fall of 2002, we authorized a major change. Arch 528g was developed as a three-credit seminar paralleling Arch 401. That curricular and pedagogical experiment continues today, and this paper addresses its operation.

THE LEGACY OF THE "MONTREAL PROJECT"

Arch 401 – Architectural Design V – is a 6.0 credit design studio offered in the fall semester of the 4th Year of the B. Arch program. Commonly referred to as the "Montreal Project," the studio is focused on the design of a medium scale, institutional program on a complex urban site in Montréal, Québec. Our selection of a distant site for the primary design project of this studio is not unique in the undergraduate design curriculum of the Department of Architecture. On the contrary, students in the undergraduate studio sequence typically have had the opportunity to visit, and often design projects for sites in such places as Minneapolis, Chicago, Madison and Milwaukee, and New York, by the time they reach fourth year. The multi-day field trip has become a standard pedagogical tool in our curriculum, one that provides students with opportunities to experience and engage paradigmatic American urban environments, and significant works of architecture outside of Iowa. This pattern continues through the fourth year, with Montreal providing the focus for the fall semester studio, and a study abroad program to Rome, Italy the focus for the spring. Students who elect not to go to Rome are offered a studio field-trip centered on the city and region of Los Angeles.

The field trip component of the 2nd through 4th Years of design studio has become an anticipated event each semester among our students. It has been a consistent element in the undergraduate studio curriculum in Architecture at Iowa State for the past decade, introduced first as a supplemental experience for the studio project. Over time, studios in the 3rd and 4th Years evolved to include project sites in New York (Spring, 3rd Year) and New Orleans (Fall, 4th Year.) The opportunity to research and design a project sited in these urban centers offered unique educational experiences for architecture students based in the midwest. Such locations

augmented locally and regionally based studies presented in 2nd year, and allowed the studio curriculum to address urban circumstances and issues not found in Iowa.

The Rome program extends this sequence, presenting students the opportunity to spend an entire semester abroad studying in an historic urban environment. Traditionally offered in the spring of the fourth year, the program is preceded in the fall by a semester in Ames, and the design studio Arch 401. This studio has been focused for more than a decade on the integration of building technologies and design, coinciding in the past with the completion of the Building Technologies course sequence in the undergraduate curriculum. Under the leadership of Marcy Schulte (Adjunct Assistant Professor, 1991-99), New Orleans was introduced as a site and field trip destination for Arch 401 in the fall of 1995. New Orleans remained the location for the Arch 401 studio project and field trip for the next four years, combining a program for an urban institution rooted in the local culture of the place (Music Conservatory, Jazz Museum, etc.), and a project site in the historic urban fabric. Students were challenged to respond to the particular urban context in their design projects, while integrating their understanding of structural design, materials and assemblies, and environmental systems, acquired in other classes taken coincidentally.

In the fall of 1999, Montreal, Quebec replaced New Orleans as the location for the primary design project and field trip of Arch 401. While extending the focus on French urban traditions in North America, Montreal introduced an international dimension, a different history, culture, and language – even a different system of measures (Metric) – to the studio project. Moreso than New Orleans, Montreal presents students with a different kind of urbanism than they are familiar with in the Midwest: a dense, historically layered urbanism with a strong pedestrian culture – it is a city in which life without a car is imaginable. In Montreal our students are exposed to a dense and diverse population that embraces the public life of the street, with such notable examples as Boulevard Saint Laurent, Rue Saint Denis, Rue Sainte Catherine, and Rue Notre Dame. It is also a city with an extensive architectural history as well as a dynamic contemporary design culture. In the central area of the city (Arrondissements Ville Marie, Plateau Mont-Royal, Outrement,) where we focus our attention on field trips, and where the project site is located, our students are exposed to numerous examples of traditional public and private architecture that engage and reinforce the street as a public space, as well as many provocative new public buildings that extend and reinterpret these traditions.

Site selection and program for the Arch 401 "Montreal Project" was developed initially in the summer and fall of 1999 in consultation with the Montreal-based collaborative Atelier Big City, and its principals Randy Cohen, Anne Cormier, and Howard Davies (joint winners of the Prix de Rome du Canadá and faculty members and the University of Québec at Montreal, U. Montreal, and McGill U. respectively), who also acted as guest critics for mid-term and final reviews. Initially two sites were selected, one of which would become the project site for the next three years. This site was a long-standing open lot at the corner intersection of two of the city's most prominent urban corridors – Rue Sherbrooke, and Boulevard St. Laurent. The site occurs at a unique moment in the topography and socio-cultural geography of the city: the intersection of the upper edge of the Sherbrooke escarpment and the "Main", the street that divides the city east from west, French and English (historically), while providing a focal point for the early immigrant populations of the city – Chinese, East Indian, East European Jews, Portuguese, Greek, and Italian. A fulcrum of socio-cultural districts and urban typologies (commercial, residential, and industrial), the site presents students with an active pedestrian context, topographic and demographic complexities, typological diversity, and even historical foundation remains of a previous building – a Greek Orthodox church that had burnt and was razed to the ground in the 1970's.

Matched to the site was a program designed to challenge familiar ways of thinking about architecture and the urban environment. While continuing the tradition of the urban institutions that Arch 401 had addressed in previous years, a new institution was developed modeled after the MIT Media Lab in Cambridge, Massachusetts. Titled the first year as "Le Centre Nationale de Multimedia du Quebec", or CNM, the program sought to tap into the current economic context of the city/province, in particular the emergence of a dynamic new Information Technologies (IT) sector. Framed as a publicly funded research and development center for new IT applications, the studio project challenged students with a detailed program incorporating a diversity of functional activities and spatial types, as well as raising questions concerning the potential impacts of new information technologies on the production and experience of architecture.

The following year the project was recast as a Media Lab for the University of Quebec at Montreal (UQAM), linking the program to a larger institutional context and geography in the city of Montreal. The link to UQAM allowed us to develop a richer story in which to set the program, defining a particular socio-cultural context in addition to that provided by the site. That link also established a stronger public dimension to the project, and a clear demand to engage the urban context, in particular the adjacent streets. The precedent of the MIT Media Lab became clearer for the students in this context. More importantly, it brought the program into a realm with which they were already familiar. Analogies could be made to other university facilities such as schools of Architecture and Design, Engineering colleges, Science buildings, etc., all of which typically combine classrooms, labs, offices, auditoriums, gallery functions, cafes, etc. We have emphasized these analogies on our field trips to Montreal with visits to exemplary recent buildings

on the University of Montreal campus (l'École des Hautes Études Commerciales, or HEC, and Faculté de l'Aménagement,) UQAM campus (Pavillion de Design, Pavillon J.-A.-DeSève), and to other recent public buildings in the area such as the Cinémathèque Québé coise and the Archives National du Québec. These field trip building tours allow our students the opportunity to experience in person some of the same conditions that they must address in the program for a hypothetical UQAM Media Lab.

In 2002 the Montreal Project became the basis for the Comprehensive Design studio, with minor revisions to the program and site parameters. Throughout its variations, the program has attempted to balance a number of spatial typologies, forcing students to develop concepts that arise from a careful analysis of adjacencies, affinities and massing considerations. In its current form, the brief is built around four laboratory work groups, each with a hardware lab, a software studio, offices for principal investigators and conference spaces. Ancillary areas include an administration suite, intended as a semi-public gateway to the labs, a large lecture theatre, a research library, and a "black box" experimental presentation space modeled after Iowa State's C-6 virtual reality studio. A number of urban amenities, including retail, a café/bar, and a digital gallery require students to consider the nature of the street interface. Studio apartments for visiting faculty raise significant questions about the transition between public and private domains. Finally, the inclusion of parking for 60 cars, and an FAR of 2.5, ensures the consideration and integration of structural systems and vertical transportation elements.

EXPERIMENTING WITH CURRICULUM AND LEARNING

To address the challenges of the Montreal site and program in a Comprehensive Design setting, we have adopted a "Studio +" pedagogy. The 401 Studio has been overhauled with increased review and presentation requirements, and the replacement of a four-week introductory problem with assignments in detailed site and program analysis. A five-day field trip to Montreal follows this, which inevitably challenges assumptions regarding context, siting and circulation. Upon return, students typically have three weeks to organize their site documentation and prepare initial schematic solutions to the web of programmatic requirements. They must demonstrate that their schemes satisfy not only area requirements and adjacency/affinity needs, but also the range of security, public/private, daylighting, and broader conceptual issues. Massing models and sections are required in addition to plans. Elevations, on the other hand, are neither required nor encouraged at this stage, to allow the 'inside out' process of program analysis to present a set of internally derived solutions. Throughout this process critiques are offered primarily on architectural and conceptual levels – even though students spend much of their time 'figuring out' how to solve the difficult, multi-layered problems of program and site, they are responsible for the architectural and urban qualities of their solution. As more than one student has described it, they cannot 'hide' behind the technical prowess or efficiency of their schemes, rather they must filter a number of options through fairly stiff architectural critiques. This requires a high level of dedication and discipline. By the mid-semester review the enormous amount of work and consideration of (often simultaneous) options results in schemes that are well resolved, well thought out, and that provide a firm footing for the detailed investigations that follow in the final eight weeks of the term.

The last half of the semester is dedicated to refining these initial schemes through levels of architectural development. As the semester progresses, interim review requirements include larger and larger scale models, encouraging students to continually focus on materials and assemblies, and to find ways to continue their conceptual thought processes at greater and greater levels of detail. The final two models, at 1:50 and/or 1:10, must demonstrate not only the integration of structure, cladding, space and services, but also must carry the major ideas of the large scale urban and architectural concepts to fruition through detail. Elevations are required during this last phase, and are critiqued based on the rich context of the site. Students must thus carry the "both/and" theme of the studio through not only the major gestures, but also through the material assemblies and details they use to 'render' their initial schemes. Requirements for the final review are unapologetically ambitious – large scale models, plans, sections and elevations, plus 1:200 site models that nevertheless must show enough of the building fabric to assess how its 'grain' relates to the complex surroundings.

In planning for the initial offering of the Montreal Project as the Comprehensive Design studio, we recognized that the effort being requested far exceeded that of a typical studio. This has proven to be a positive goal, as students overwhelmingly report that they appreciate being 'pushed' to develop their schemes in greater and greater detail. However, to ease the burden we have adopted a number of strategies that enable this greater depth to occur without overtaxing our students. First, we encourage students to work in teams of two throughout the semester, primarily to spread out the workload involved in the numerous models and drawings required (75-100 square feet of drawings in addition to three or four models). This has the added benefit of encouraging student teams to debate issues internally, and adds a sense of collaboration to the projects-something that no actual architectural project comes without, yet an aspect of the profession that is rarely simulated in studios. Second, we adopt a 'working drawing' approach, encouraging black line 2-D drawings and highly detailed models over elaborately rendered images. Many students choose to work in CAD, consequently, generating and changing drawings as necessary throughout the design process.

Most importantly, the "studio +" approach offers a parallel workshop course designed to refresh the students' understanding of building technologies and provide a scheduling 'scaffold' to help them pace the development of their projects. This course – Arch 528g, "Integrated Design Workshop" – covers seven major aspects of building design from both quantitative and qualitative points of view, offering information designed specifically to assist the studio project. The seven areas considered – Program Analysis, Site Inventory, Circulation, Structural Systems and Elements, Environmental Control, Core Design, and Cladding – are each covered in two 90-minute lectures, followed up with regularly scheduled workshops with the faculty that allow students to gain additional hands-on knowledge in areas that either interest or intimidate them. The use of the seminar format permits students to see – and critique – how their peers are tackling problems similar to their own. Each topic is also covered by an assignment that requires students to develop the relevant systems from their studio projects and to present it in brochure form. These brochures must 'stand alone', that is, they must present the topics in sequence to an audience that is entirely unfamiliar with the project. This requirement demands that students both diagram and describe in writing the solutions and systems they have adopted. While this process leads inevitably to clearer focus during presentations, it also forces self-critique of design decisions by the students themselves, as abstruse or technically infeasible solutions must pass this additional hurdle. Final grades for the Workshop are determined by the extent to which the collection of brochure assignments has been assembled into a coherent technical narrative of the Montreal project.

From the students' perspective, the Integrated Design Workshop essentially adds three more credits to the six-credit studio. However, it also offers a framework for incorporating greater levels of technical detail into the studio project. While the Workshop course often goes into greater detail than the studio requires, the level of integration that this fosters is apparent in the students' design work.

REFLECTIONS, DIRECTIONS AND SUMMARY

Student evaluations and feedback for the Montreal Studio and its Workshop component have been surprisingly positive, given the intensity of their requirements and the expectations for such disciplined work, though a number of suggestions and complaints have pushed us to change or reformat parts of both. Typical responses to the studio are that students appreciate being challenged, and they appreciate even more the willingness of the studio faculty to put in a higher level of effort to bring projects to a more complete, integrated level. "I felt motivated but not pressured," "we were inspired, motivated, pushed, and we *learned,*" and "...an excellent job of helping us, pointing us in the right direction without making us feel like idiots" are typical comments reflecting the enthusiasm students show for the challenge of the semester. Many report that the Montreal project is "by far the best" they have done, and feedback from former students suggests that even after their final year in the program the Montreal project remains a favorite, and often takes center stage in portfolios. While we were concerned that students would resent a semester in which such onerous technical requirements would seemingly push aside a great deal of their cherished conceptual work, the vast majority of comments indicate that they respect and understand the importance of – at least once in their academic career – being held to very high objective standards.

Evaluations have also pointed out a number of issues-often logistical – that we have sought to address as the Studio has developed. The design team concept has also had its critics. A few teams have experienced significant discord, or more troublingly a disparity in effort between partners. We have adopted policies, consequently, that allow individual grades to reflect a review by one's partner, which has given students the assurance that grades will fairly reflect one's own effort. Several students have expressed concerns about the lack of "theory" in the studio, but we have also received numerous evaluations emphasizing that the Comprehensive Design studio has inspired them to "discover that the materiality of architecture can be as fascinating as theory and cultural research." Ultimately we hope to encourage students to see the design goals of the Montreal Project as part of a continuum that includes – and in the best cases fully engages – critical inquiry, theory, and technical rigor.

Likewise, the Workshop course has received predominantly positive reviews, although again with some reservations and suggestions that have proven useful in the evolution of the course. Students have generally reported that the lectures were "informative and useful" in the development of the studio project, that the course overall was "effective" and should be mandatory for students enrolled in the Montreal Studio. Concomitantly, here has been an overwhelming concern that the semester structure as originally planned – a detailed assignment due about every two weeks – did not accommodate the often unpredictable pace of an individual studio project. The result was that in early versions of the course, students felt the assignments were either meaningless, as they projected too far ahead of the design problem, or 'busy work' as they reflected design efforts that had occurred much earlier. In response to these evaluations, our current plan substitutes booklets or 'client reports' for actual parallel assignments. While this involves considerable effort in terms of graphic design and narrative explanation, we suspect that the opportunity to explain, in hindsight, how various solutions were formed will allow students the flexibility they have desired. A summer version of this course taught in conjunction with a second year graduate studio demonstrated the effectiveness of this approach.

Overall, we believe that the 'Studio +' approach has given our students a valuable opportunity to push their knowledge and their abilities in design/technology. Our development of these courses has been rewarded by the enthusiasm our students show for the challenge and the intensity of the semester. Participation in the elective workshop course has stabilized at between 1/2 and 2/3 of the studio roster, which demonstrates the reputation the Workshop has developed as a useful component. Students now arrive in the Montreal Studio well prepared by its reputation and the war stories told by their peers, and they genuinely relish the chance to tackle a now historically difficult semester. As the integration of technology with design, history and theory becomes a more fertile ground for research, and as the NAAB requirement for comprehensiveness continues to settle, the Montreal Studio presents a useful case study for how the often-irreconcilable elements of building technology and architectural design can be fully integrated in studio education.

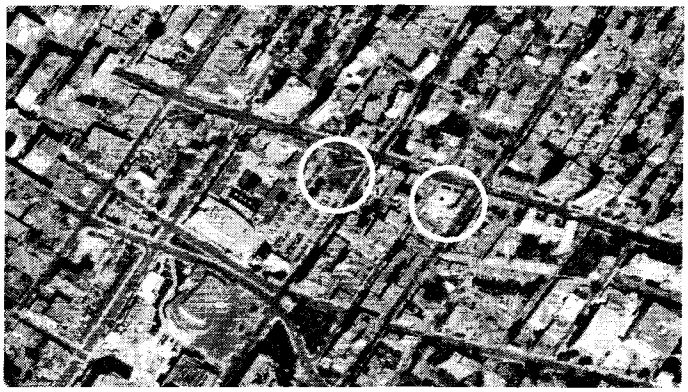

Fig. 1. Montreal, Quebec. Aerial photo showing location of ARCH 401 studio sites. Rue Sherbrooke runs across the site from left to right. Place des Artes complex is at bottom left.

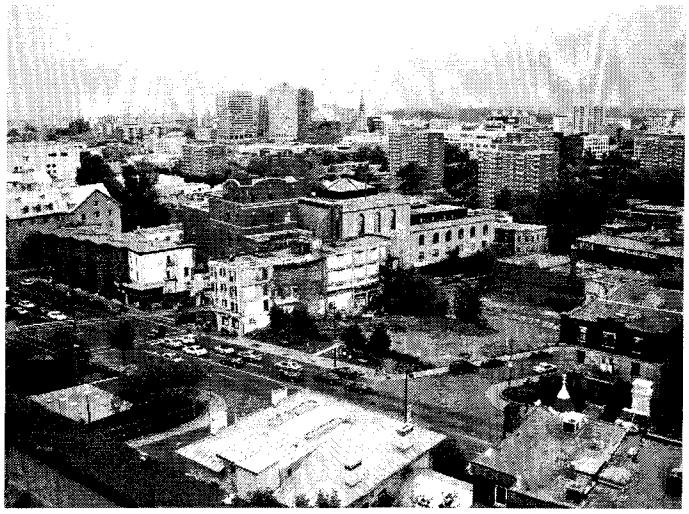

Fig. 2. The Montreal site has until this year been a vacant lot on the corner of Rue Sherbrooke and Rue St. Denis, a void that includes residential, commercial and industrial neighbors. Its location on the Sherbrooke escarpment provides views of downtown skyscrapers.

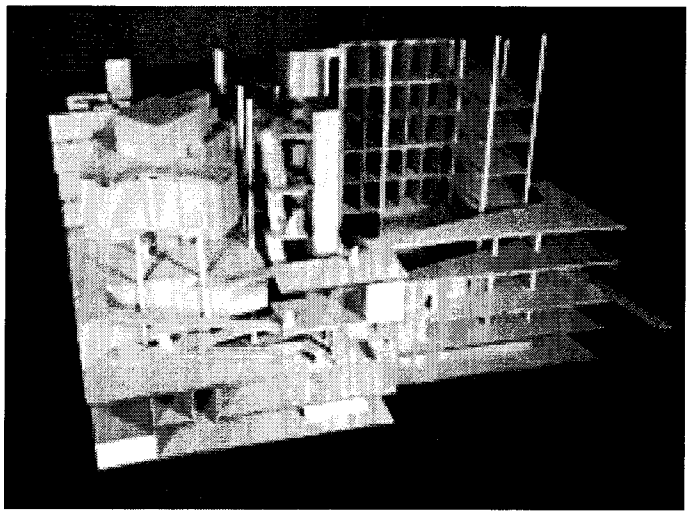

Fig. 3. Typical process model, shown at schematic design stage (halfway through semester). By this point, the emphasis has shifted from programmatic disposition to thoughts about circulation and structure.

Fig. 4. Final review, showing extent of drawing and model requirements. Review panels typically comprise a range of jurors, from practitioners to volunteers from (among others) the University's philosophy department. This emphasizes the broad range of forces to which public design must respond.

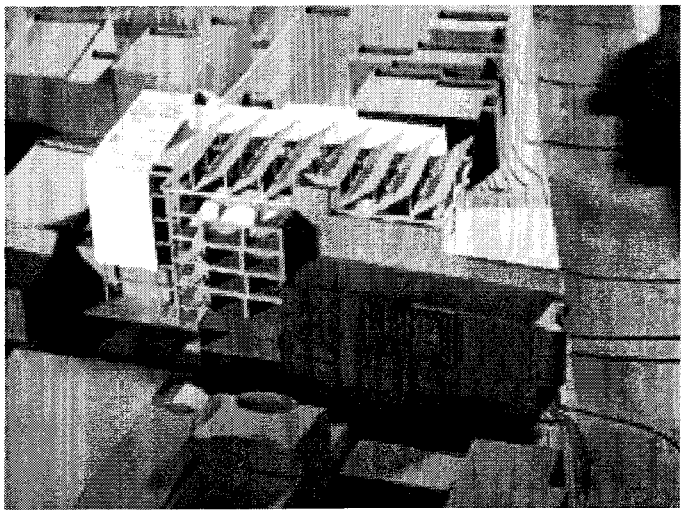

Fig. 5. 1:200 site model showing relationship to surrounding buildings and spaces, overall massing and coarse-grain cladding strategy

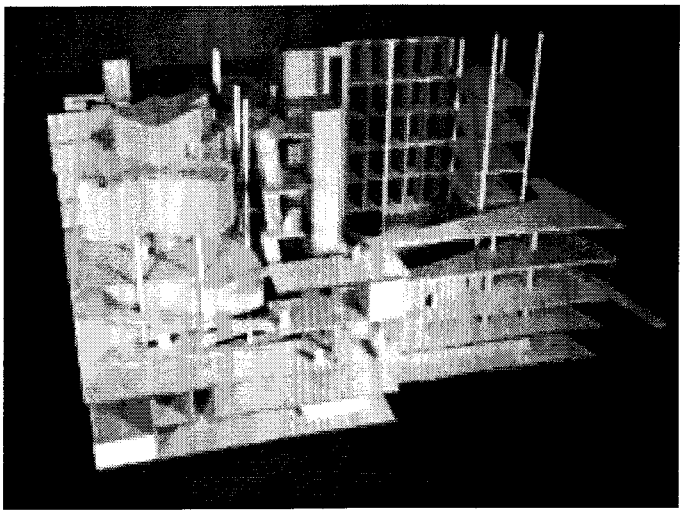

Fig. 6. 1:100 massing model showing programmatic layout, circulation, and structural schemes.

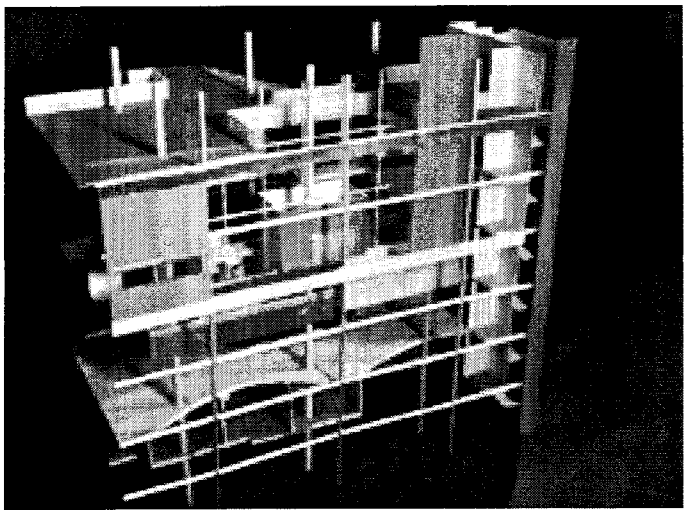

Fig. 7. 1:50 detail model showing systems, materials and connections.

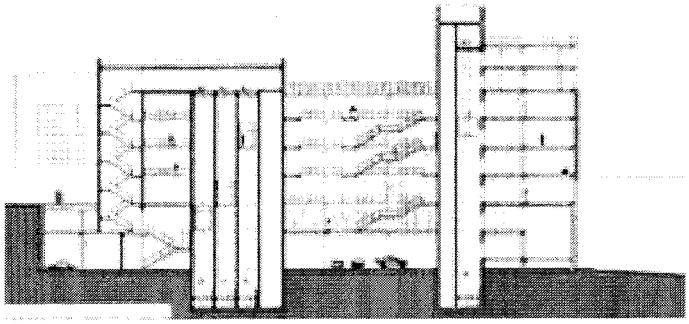

Fig. 8. Typical section drawing showing disposition of program and stratification.